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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/616,372

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Atsushi Komura

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7590

06/30/2004

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EXAMINER

SOUW, BERNARD E

ART UNIT

PAPER NUMBER

2881

DATE MAILED: 06/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n No.

09/616,372

Applicant(s)

KOMURA ET AL.

Examiner

Bernard E Souw

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-7,9,10,12-14,16-18,20 and 21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5-7,12,13,16-18 and 20 is/are rejected.
- 7) ☒ Claim(s) 2,3,9,10,14 and 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. <u>04/20/2004</u> |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Finality Withdrawal of 11/25/2003 Office Action

1. As a result of a personal interview conducted on 04/20/2004 the previous finality of the Office Action dated 11/25/2003 (mailed 12/05/2003) is now withdrawn. Consequently, the After Final Amendment filed 03/26/2004 has been entered.

The present Office Action is made with all the suggested amendments being fully considered.

Amendments

2. The specification has been amended.

The claims have been also amended.

Claims 4, 8, 11, 15 and 19 have been cancelled.

Pending in this Office Action are claims 1-3, 5-7, 9, 10, 12-14, 16-18, 20 and 21.

35 U.S.C. § 112 Objections

3. The After Final Amendment having adequately explained the variable y in Eq. 2 as being the apparent thickness, in contrast to constant b , which is the actual thickness, the previous objections of claims 3, 10, 14 and 21 under 35 U.S.C. § 112 are now withdrawn.

Objection of the Figure Drawing

4. The new Fig. 3 as amended on 03/26/2004 is objected to: the vertical axis presently labeled as "*SiO₂ Film Thickness*" must be labeled "*Apparent SiO₂ Film Thickness*", i.e., in accordance with the After Final Amendment recited above.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 5-7, 12, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bozada et al. (USPAT # 6,004,881) in view of Kobayashi et al. (USPAT # 6,221,788).

► Regarding claims 1, 5, 12 and 16, Bozada et al. discloses a method for measuring thickness of an oxide film, as recited in Col.6/30-37. Bozada's method comprises:

- forming an oxide film on a substrate, as recited in Col.6/11.18-22;
- measuring an "*exposure period of time from a time at which the thickness of the oxide film is measured*", which is inherent in Col.6/11.21-36, as represented by the parameter t in Eq.(1) recited in Col.6/11.35-36;

Note: *Bozada et al. may have measured the exposure time period for a purpose different than Applicant's. While Applicant's use of the measured exposure time period for correcting film thickness is clearly described in the specification, they were not explicitly claimed in claims 1, 5, 12 and 16. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).*

measuring the thickness of the oxide film by irradiating the oxide film with light in accordance with the "exposure period", as recited in Col.6/ll.30-33 and represented by Bozada's Eq.(1).

However, although a step of washing or cleaning the substrate is conventional, and hence, must be also inherent in Bozada's, as generally known to one of ordinary skill in the art, the step is not explicitly recited in Bozada's.

Kobayashi et al. disclose a step of washing or cleaning an oxide surface to remove the native oxide, as recited in Col.6/ll.17-47. which, when used in combination with Bozada's method, is conducted prior to conducting Bozada's thickness measurements, as understood by one of ordinary skill in the art. This limitation is especially recited in claims 5 and 16,

It would have been obvious to one of ordinary skill in the art at the time the invention was made to clean Bozada's oxide surface using Kobayashi's RCA cleaning method prior to conducting thickness measurement, in order not to have the result of measurement falsified by the existence of a native oxide, as taught by Kobayashi et al. In Col.6/ll.33-36, or at least, having a definite starting time point to take into account a

re-growth of the natural oxide as a function of time, as implicated by Bozada et al. in Eq.(1).

- Especially regarding claims 12 and 16, the additional steps of “*determining whether the oxide film thickness falls in a desirable range*”, and “*performing a succeeding step for manufacturing the semiconductor device when the oxide thickness falls in the desirable range*” are quite trivial for being inherent and/or conventional in every semiconductor manufacturing process (quality control).
- Regarding claims 6, 7, 17 and 18, Kobayashi et al. teach a method to clean an oxide surface using a solution containing HCl and hydrogen peroxide, thus simultaneously rendering obvious claims 6 and 17 (regarding a solution containing at least one of H₂SO₄ and HCl) as well as claims 7 and 18 (regarding a solution of HCl with hydrogen peroxide).

Such a cleaning method is well known in the art as the RCA cleaning method. The cleaning solution, known as RCA clean, has been widely used since 1965, as recited in <http://www.mines.edu/fs_home/cwolden/chen435/clean.htm>.

Allowable Subject Matters

7. Claims 2 and 9 are objected to as being dependent upon a rejected base claim(s), but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 3, 10, 14 and 21 contain allowable subject matter, provided the word "apparent" is added to the wording "*y is the thickness of the oxide film*" to become "*y is the apparent thickness of the oxide film*".

9. Claims 12 and 16, consequently also claims 13 and 20 dependent thereof, contain allowable subject matter, provided the word "actual" is added to the wording "*determining the thickness of the oxide film*" to become "*determining the actual thickness of the oxide film*".

Reasons for Allowance

10. The method of determining the real or actual thickness of an oxide film from the (apparent) thickness measured after an exposure to ambient atmosphere based on the exposure time that has elapsed since the film was formed, thereby making use of a formula given in the specification, more explicitly recited in claims 3, 10 and 14, has not been anticipated nor rendered obvious by any prior art.

RESPONSE TO APPLICANT'S ARGUMENTS

11. Regarding Applicant's argument against the finality of the last (final) office action mailed 12/05/2003, i.e., that the § 103 rejections of claims 6, 7, 17, and 18 over Bozada et al. and Kobayashi et al. "*does not appear in any earlier office actions including the one mailed on 07/08/2003*" (Applicant's after-final remarks, page 10, lines 1-2 from bottom), it is noted that exactly the same rejection (regarding the RCA cleaning solution)

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has been previously applied in the non-final office action mailed 07/08/2003 on page 14, section 19, lines 1-5 from bottom. The present office action is made non-final because of the new aspect brought up during the 04/20/2004 personal interview, which necessitates a reconsideration of claims 2 and 9 in light of the specification.

Communications


12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 571 272 2482. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 571 272 2477. The central fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for regular communications as well as for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes

June 08, 2004


JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800